SAN DIEGO COUNTY VECTOR CONTROL PROGRAM

MOSQUITO, VECTOR AND DISEASE CONTROL ASSESSMENT

ENGINEER'S REPORT

FISCAL YEAR 2008-09

JUNE 2008

PURSUANT TO THE GOVERNMENT CODE , HEALTH AND SAFETY CODE AND ARTICLE XIIID OF THE CALIFORNIA CONSTITUTION

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INTRODUCTION

The San Diego County Vector Control Program ("VCP" or "Program") exists within the County of San Diego Department of Environmental Health ("DEH"). The VCP is responsible for mosquito and vector-borne disease surveillance and control services in all 18 incorporated cities and the unincorporated areas of San Diego County. The VCP has been protecting the health of San Diego residents for over 30 years. It is managed by County Staff and is governed by the San Diego County Board of Supervisors ("Board").

The VCP's core services include:

1. Early detection of public health threats through comprehensive vector surveillance.
2. Protection of public health by controlling vectors or exposure to vectors that transmit diseases to humans.
3. Appropriate, timely response to vector-related customer complaints.

In 2005, a new property benefit assessment was approved by property owners within the County of San Diego. Since 1989 funding for the VCP program was a service charge levied against all parcels in the county. When Proposition 218 was passed in 1996 it froze our service charge at $3.00 for the Coastal Region and $2.28 for both Inland Regions. Proposition 218 requires a demonstration that services are a benefit to a property. This report defines the benefit assessment, which provides funding for the mosquito, vector and disease control services throughout San Diego County. It also provides funding for necessary equipment, capital improvements, services, facilities and incidentals for mosquito and vector control programs.

The following are primary services funded by the Mosquito, Vector and Disease Control Assessment:

- Mosquito surveillance
- Mosquito control through treatment of mosquito breeding sources
- Public Education/Outreach through the media, presentations to schools and civic groups
- Emergency response to disasters and recovery efforts; vector control and surveillance actions
- Provide direction for control and remediation of habitat or vegetation supporting mosquito breeding to residents and property owners
- Distribute mosquito fish for backyard fish ponds and other appropriate habitats
- Rodent-borne and tick-borne disease surveillance

- Surveillance for emerging and historical vector-borne diseases
- Response to service requests and complaints regarding mosquito and fly breeding sources and the presence of rats
- Identification of mosquitoes, ticks and other arthropods for businesses and the public

As used within this Report, the following terms are defined:

> *"Vector" means any animal capable of transmitting the causative agent of human disease or capable of producing human discomfort or injury, including, but not limited to, mosquitoes, flies, mites, ticks, other arthropods, and small mammals and other vertebrates (Health and Safety Code Section 2002(k)).*
>
> *"Vector Control" shall mean any system of public improvements or services that is intended to provide for the surveillance, prevention, abatement, and control of vectors as defined in subdivision (k) of Section 2002 of the Health and Safety Code and a pest as defined in Section 5006 of the Food and Agricultural Code (Government Code Section 53750(m)).*

The VCP authority is found in the Mosquito Abatement and Vector Control District Law of the State of California law. Following are excerpts from the Mosquito Abatement and Vector Control District Law of 2002, codified in the Health and Safety Code, Section 2000, et seq. which serve to summarize the State Legislature's findings and intent with regard to mosquito abatement and other vector control services:

> 2001. (a) The Legislature finds and declares all of the following:
> (1) California's climate and topography support a wide diversity of biological organisms.
> (2) Most of these organisms are beneficial, but some are vectors of human disease pathogens or directly cause other human diseases such as hypersensitivity, envenomization, and secondary infections.
> (3) Some of these diseases, such as mosquitoborne viral encephalitis, can be fatal, especially in children and older individuals.
> (4) California's connections to the wider national and international economies increase the transport of vectors and pathogens.
> (5) Invasions of the United States by vectors such as the Asian tiger mosquito and by pathogens such as the West Nile virus underscore the vulnerability of humans to uncontrolled vectors and pathogens.
> (b) The Legislature further finds and declares:
> (1) Individual protection against the vectorborne diseases is only partially effective.

> (2) Adequate protection of human health against vectorborne diseases is best achieved by organized public programs.
> (3) The protection of Californians and their communities against the discomforts and economic effects of vectorborne diseases is an essential public service that is vital to public health, safety, and welfare.
> (4) Since 1915, mosquito abatement and vector control districts have protected Californians and their communities against the threats of vectorborne diseases.
> (c) In enacting this chapter, it is the intent of the Legislature to create and continue a broad statutory authority for a class of special districts with the power to conduct effective programs for the surveillance, prevention, abatement, and control of mosquitoes and other vectors.
> (d) It is also the intent of the Legislature that mosquito abatement and vector control districts cooperate with other public agencies to protect the public health, safety, and welfare. Further, the Legislature encourages local communities and local officials to adapt the powers and procedures provided by this chapter to meet the diversity of their own local circumstances and responsibilities.

The authority granted to the Board of Supervisors by the 2005 ballot authorized the levy of an assessment for funding the services previously summarized. The maximum assessment rate of $8.55 per single family home, subject to an increase each subsequent year by the San Diego Area CPI (Consumer Price Index) not to exceed 5% per year was established at that time.

In each subsequent year for which the assessments will be levied, the Board will publish a legal notice of the intent to continue the assessments for the next fiscal year in a local newspaper, and the date when the Board will hold a public hearing. At the annual public hearing, members of the public can provide input to the Board prior to the Board's decision on continuing the services and assessments for the next fiscal year. The Board must approve at this meeting; 1) a budget for the upcoming fiscal year's costs and services, 2) an updated annual Engineer's Report and 3) an updated assessment roll listing all parcels and their proposed assessments for the upcoming fiscal year. After the conclusion of the public input portion of the hearing, the Board may take action by resolution, to approve the levy of the assessments for each fiscal year. Since the initial Single Family Equivalent assessment rate of $8.55 in 2005, the rate has been reduced each year to the current proposed rate of $5.92 which is the same rate as 2007/2008. The fiscal year 2008/2009 budget includes outlays for West Nile Virus Strategic Response activities, WNV prevention education, surveillance and mosquito control, habitat remediation, capital equipment, supplies, vector-borne disease testing programs and vector control programs.

CERTIFICATES

1. The undersigned respectfully submits the enclosed Engineer's Report and does hereby certify that this Engineer's Report, and the Assessment and Assessment Diagram herein, have been prepared by me.

_____

Engineer of Work, License No. C52091

2. I, the County Auditor of the County of San Diego, California, hereby certify that Assessment Roll and Assessment Diagram for fiscal year 2008-09 were filed with me on _____, 2008.

_____

County Auditor, County of San Diego

GENERAL DESCRIPTION OF THE PROGRAM AND PROPOSED SERVICES

ABOUT THE VECTOR CONTROL PROGRAM

The VCP operates within the County of San Diego Department of Environmental Health (DEH) and monitors disease-carrying insects such as mosquitoes, ticks and other harmful pests such as flies and rats. The program protects the health and comfort of the public through the control and abatement of mosquito breeding sources. In addition VCP provides property inspections and advice for control of domestic rats, flies and other pests which are a threat to human health and well being. The VCP conducts surveys and tests for diseases carried by insects and small mammals. The VCP educates the public about how to prevent and protect themselves from disease carrying vectors such as mosquitoes which are vectors for West Nile Virus.

SUMMARY OF SERVICES

The purpose of the VCP is to protect public health and reduce the risk of mosquito and other vector-borne diseases and nuisances throughout the County. This year the program provided residents services and protection through three emergencies: the increased impact of West Nile Virus infection afflicting fifteen humans, the 2007 wild fires and the landslide at Mt. Soledad. All three of these emergencies required an increase in staff resources to combat potential threats to the health of the community.

In addition to being nuisances by disrupting human activities and the use and enjoyment of property, certain insects and animals may transmit a number of diseases. The diseases of most concern are: West Nile Virus (WNV), Western Equine Encephalitis (WEE), St. Louis Encephalitis (SLE), and Malaria, which are all transmitted by mosquitoes; Plague, transmitted by fleas; Hantavirus Pulmonary Syndrome, transmitted by certain species of wild animals; and the tick-borne diseases including Lyme disease and Tularemia.

The spread of these diseases and the impact vectors have on property is minimized through ongoing vector surveillance activities, source reduction, source treatment, abatement, and educational outreach. These efforts also minimize the nuisance impact vectors can have on property and residents. To fulfill this purpose, the VCP may take any and all necessary steps to control mosquitoes, monitor rodents and other vectors, and perform other related vector control services.

Currently, the VCP provides vector control and disease surveillance service as well as general public information. The Services are further defined as follows:

- Responds to mosquito problems as well as other pestiferous or disease carrying organisms.
- Applies mosquito larvicides to control mosquito breeding via helicopter.
- Prepares to apply mosquito adulticides in the event of a declared public health emergency to control adult mosquito populations as determined by the Director of Environmental Health and the Public Health Officer.
- Participates in emergency response and recovery vector surveillance and control activities.
- Assists the public in the control of rats and other rodents through onsite inspection and advice, the provision of a "Rat Control Starter Kit" and public education.
- Monitors Hantavirus-bearing rodents, and other harmful vectors such as Deer Mice, through trapping and testing.
- Provides recommendations for rodent exclusion, control, and public education.
- Surveys adult mosquito populations using carbon dioxide baited traps, and Reiter Gravid traps to assess public health risks and allocate control efforts.
- Monitors for mosquito-transmitted diseases such as West Nile Virus, St. Louis Encephalitis, and Western Equine Encephalitis.
- Maintains sentinel chicken flocks for analytical blood studies for State and local public health agencies.
- Submits mosquito specimen "pools" to the State for pathogen testing.
- Cooperates with the State Department of Health Services and State Universities to survey and identify arthropod-borne diseases such as Lyme disease and Plague found in parks, campgrounds, on trails and other locations frequented by the public.
- Facilitates monitoring and testing for diseases carried and transmitted by ticks, such as Lyme disease and Tularemia.
- Monitors and/or provides advice for controlling other nuisance and potentially hazardous organisms and vectors such as ticks, mites, and fleas.
- Educates residents about the risks of diseases carried by mosquitoes, flies, insects, and small mammals, and how to better protect themselves.
- Assists State and universities in testing for Hantavirus, Plague and other diseases carried by small mammals.
- Monitors new and emerging vectors such as the Asian Tiger Mosquito and emerging pathogens.

- Provides education programs on vectors and disease abatement at schools, civic group meetings and community events.
- Develops and distributes printed material and brochures that describe what residents, employees and property owners can do to keep their homes and property free of mosquitoes and other vectors, and how to protect themselves from disease.
- Web site development and maintenance.

The VCP protects the public from vector-borne disease and mosquito nuisance while protecting the environment, through a coordinated set of activities collectively known as the Integrated Vector Management Program (IVMP). For all vectors, public education is the primary control strategy. Next, the VCP determines the abundance of vectors and the risk of vector-borne disease or discomfort through evaluation of public service requests and field and laboratory surveillance activities. If the populations exceed or are anticipated to exceed the public threshold of tolerance, VCP staff will employ the most efficient, effective, and environmentally sensitive means of source control. Where feasible, physical control activities such as water management are instituted to reduce vector production. When these approaches are not effective or are otherwise inappropriate, biological control using naturally occurring bacteria within environmentally friendly larvicides are used in the specific pest breeding locations or pest-harboring areas.

The VCP's services and performance measures for 2007 are further summarized in the figure on the following page:

FIGURE 1 – SUMMARY OF SERVICES AND PERFORMANCE MEASURES

CORE FUNCTION	PERFORMANCE MEASURE
Early detection of public health threats through comprehensive vector surveillance.	1. Appropriate levels of surveillance for early detection of disease ▪ Set 10 Gravid Traps per week for mosquito surveillance ▪ Set 70 CO_2 traps for mosquito surveillance ▪ Test for Hantavirus weekly ▪ Test for Plague at high and low elevations weekly (March – November) ▪ Increase ticks surveillance to twice weekly, November through March, for the presence of Lyme and Tularemia disease.
Protect public health by reducing vectors or exposure to vectors that transmit diseases to humans.	2. Work with property owners of small mosquito breeding sources ▪ Evaluate, modify and/or eliminate small mosquito breeding sources ▪ A target goal of 20 small source remediation actions 3. Rodent borne disease ▪ Treat rodent burrows where plague is detected to eliminate fleas and stop spread of disease ▪ Provide guidance to property owners in eradicating mice and removing contaminants from buildings where Hantavirus is found 4. Protect the environment by using least toxic and least invasive means for mosquito control in sensitive habitats ▪ Training and guidelines for Vector staff ▪ Ongoing review of emerging technologies and control methods ▪ Work closely with wildlife and MSCP agencies 5. Increase awareness of vector borne disease prevention and control ▪ Conduct 9 classroom outreach presentations to primary and/or secondary school classrooms, or approximately 236 students ▪ Develop informative press releases when disease is detected ▪ Distribute 50,000 education materials annually ▪ Develop a WNV prevention campaign targeting seniors
Prevent and control vector-borne diseases through timely response to complaints	▪ Review manure management plans annually for active facilities ▪ Inspect poultry ranches quarterly ▪ Target a 3-day contact and/or field response time for complaints ▪ Provide Rat Control Starter Kits as part of an onsite inspection for rats ▪ Resolve 90% of complex complaints (those involving additional agencies or departments) within 30 days

THE WEST NILE VIRUS STRATEGIC RESPONSE PLAN

The purpose of the West Nile Virus Strategic Response Plan is to implement an integrated, risk-based response designed to promote safe and livable communities, educate and involve County of San Diego agencies, residents and visitors in the year-round effort to control mosquito breeding and minimize environmental and economic impacts associated with West Nile Virus.

The WNV Strategic Response Plan is based on conditions established by the California Department of Health Services (CDHS) California Mosquito-borne Virus Response Plan and the Centers for Disease Control (CDC). Three response levels are identified as normal season, emergency planning, and epidemics of WNV. In 2003 the Board of Supervisors adopted the West Nile Virus Strategic Response Plan (Plan), to establish an organized and planned response to the virus within the county. The Plan was updated in 2004 to address the potential emergency use of adulticides if deemed necessary. This plan was used extensively in 2007 with the introduction of the WNV into the human population.

In September of 2007, the VCP increased its level of response from a "Normal Season" to a Level II Emergency Planning consistent with the West Nile Virus Strategic Response Plan. This heightened level response was due to seven locally acquired human cases, (fifteen at the end of the year), an increasing number of horses, dead birds and positive mosquito pools. The VCP increased surveillance and control efforts in response. This included helicopter "fly-overs" looking for green swimming pools and stagnant water, as well as door-to-door inspections for mosquito breeding sources in the neighborhoods of human victims. Small mosquito breeding sources such as watering cans, ponding irrigation water, or decorative water features were identified in the yards of every human victim. In one case, mosquitoes trapped at a victim's home tested positive for the virus.

In addition, the VCP dramatically stepped up the WNV outreach campaign by developing and buying radio and television advertisement air time to educate the public about the current increased threat of West Nile Virus. Additionally, letters were sent to realtors and realty associations about foreclosed properties with "green pools" that can become mosquito breeding sources. Letters were sent to residents about the presence of WNV in neighborhoods where people had contracted the disease, and all county employees received information on how to protect themselves from acquiring the virus.

A review of the WNV Strategic Response Plan and its implementation is being conducted by VCP staff. Using the lessons learned from the fall of 2007, the Plan will be revised to reflect a previously unidentified source for mosquitoes, green pools, and other

environmental conditions. The updated WNV Plan will be posted on the website at www.sdfightthebite.com.

PUBLIC EDUCATION/OUTREACH

The goal of VCP outreach is to educate and inform San Diego County residents about WNV specifically, and mosquito control generally. The methods used to achieve this goal include outreach materials in both English and Spanish, available through the web and other media; the implementation of an education campaign aimed at prevention and education rather than reaction and alarm; proactive press releases and media contact; and the establishment of the County of San Diego as the local resource regarding West Nile Virus. Two web sites have been developed to assist the community with information and reporting of concerns: www.SDVector.com and www.SDFightTheBite.com

Health education, outreach, and raising awareness in the county are all integral parts of the West Nile Virus (WNV) Strategic Response Plan. An aggressive proactive approach is used in educating county residents about the risks of WNV and the preventive measures they can take to protect themselves and their communities. Strategies included conducting educational presentations to high-risk target groups such as seniors, migrant farm workers and the Spanish speaking community, staffing informational displays at Health Expos and Street Fairs, and collaborating with different County and City departments and organizations.

Educational materials that the program distributes include a dual English/Spanish WNV DVD, English/Spanish WNV Pamphlet and Bookmarks, WNV Calendars, Mosquito Activity Books, WNV Magnets, and WNV Stickers. These materials are used to increase the visibility of Vector Control and as a way to reach a larger audience. In 2007, the VCP distributed over 131,000 WNV pamphlets and bookmarks were distributed at more than 1000 public locations such as all public libraries, public health centers, county public counters, homeless shelters, WIC offices, and City Halls throughout the county.

The outreach staff further developed and improved the county's WNV website, www.SDFightTheBite.com, providing valuable, up-to-date information for residents about personal protection and elimination of mosquito breeding sites around their homes. They included Federal, State, and local links for additional information and tracking of WNV and posted the WNV video and public service announcements for personal viewing. Outreach staff utilized press releases, press conferences and media events to help deliver WNV prevention information. They distributed press packets containing educational materials to all media who attended the events and distributed Public Service Announcements to all of the local television stations.

In addition to West Nile Virus, general vector outreach and education was increased. Rats, Hantavirus and Plague were added to the outreach agenda. The same aggressive proactive approach that is used for the WNV outreach campaign is used towards tats, Hantavirus, and Plague. Presentations, tabletop displays, and pamphlets were created and distributed to the public for all four topics. Rural locations throughout the county were targeted for Hantavirus and Plague education. Rat Control Starter Kits are provided to the resident during site consultations. These kits have information about how to deal with rat problems themselves and to publicize Vector Control Program rat services.

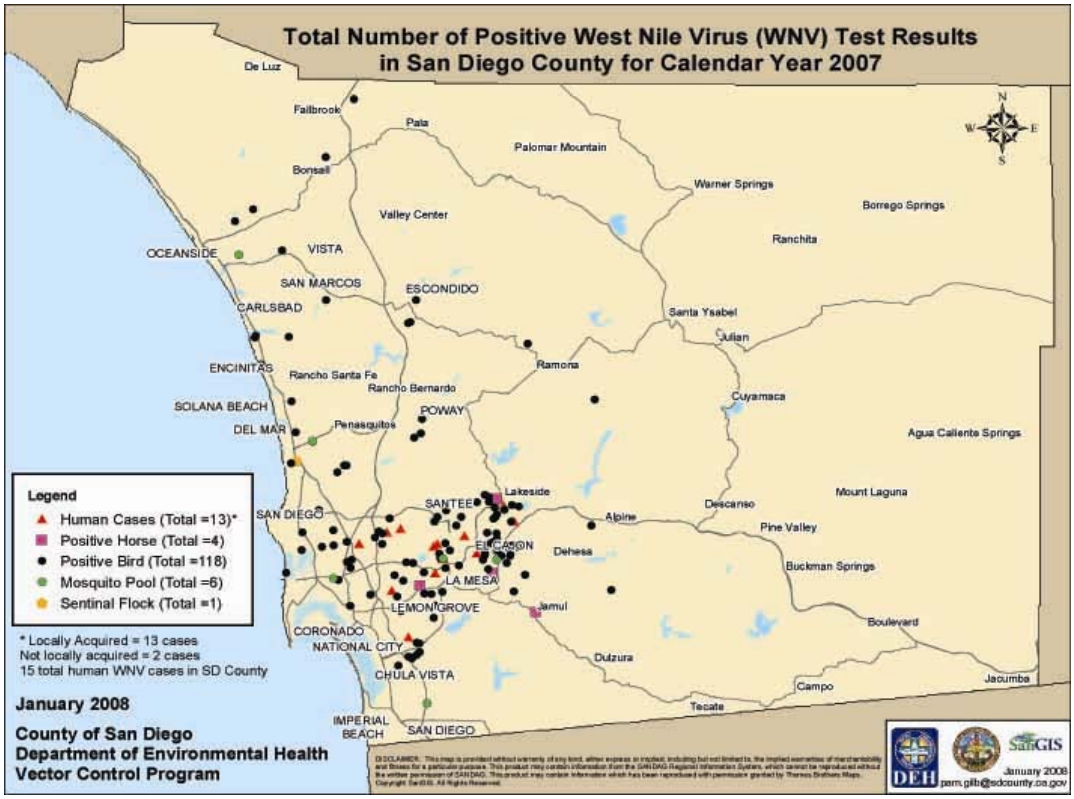
SURVEILLANCE: MOSQUITO BORNE DISEASES

Certain species of mosquitoes found in San Diego County can transmit Malaria, St. Louis Encephalitis, Western Equine Encephalitis, West Nile Virus, and potentially other encephalitis viruses. While not all species of mosquitoes transmit disease, all species can cause human discomfort when the female mosquito bites to obtain blood. Reactions range from irritation in the area of the bite to severe allergic reactions or secondary infections resulting from scratching the irritated area. Additionally, an abundance of mosquitoes can cause economic losses, and loss of use or enjoyment of recreational, agricultural, or industrial areas. Of the world's three thousand mosquito species, more than fifty live in California, and twenty-four have been identified in San Diego County. Continuous surveillance and special control efforts are aimed at the most common species in the county.

VCP conducts surveillance of mosquitoes that could transmit West Nile Virus (WNV), Western Equine Encephalitis (WEE), and St. Louis Encephalitis (SLE). Testing for West Nile Virus would have also detected the presence of Western Equine Encephalitis and St. Louis Encephalitis, but none of these other arbo-viruses were detected in 2007.

The progression of WNV in San Diego County began in 2003 when the virus was discovered in the county. There were no human infections acquired within the county until 2006. In 2006 there was one confirmed, locally acquired human case of WNV. In 2007 there was a significant increase in the WNV infection rate. There were fifteen locally acquired human infections, and 14 of the 15 cases were over the age of 50. Fortunately there were no mortalities. Testing of dead birds is used as an indication of the level of virus present that could be transmitted by mosquitoes.

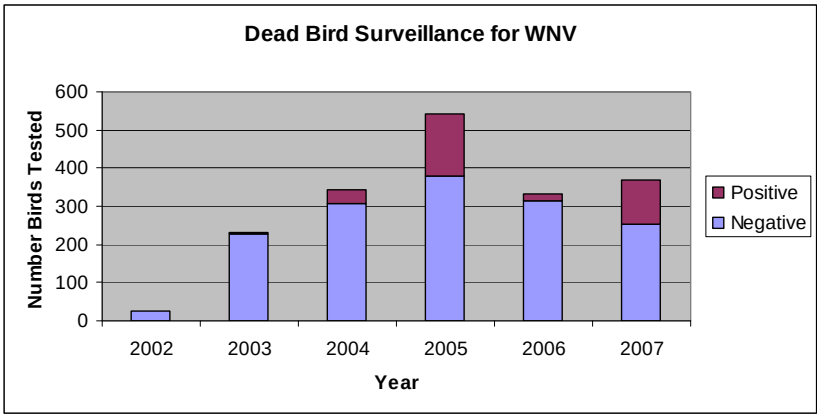
FIGURE 2 – WEST NILE VIRUS POSITIVE SURVEILLANCE IN 2007



DEAD BIRD TESTING

Dead bird testing is a valuable surveillance tool in detection of West Nile Virus in the County and State. Figure 3 demonstrates the increase in dead bird testing since 2003. By identifying concentrations of positive dead birds in the county, VCP was able to focus its surveillance and control efforts in the East County, which was the most impacted area in 2007.

FIGURE 3 – 2007 DEAD BIRD TESTING



As part of the bird testing program, laboratory analysis performed by the County Veterinarian staff is used as a confirmatory tool in the bird testing program. VCP Vector Ecologists contacted all persons submitting positive birds, and VCP staff investigated and treated any mosquito breeding discovered near the locations where the birds were found.

SENTINEL CHICKENS

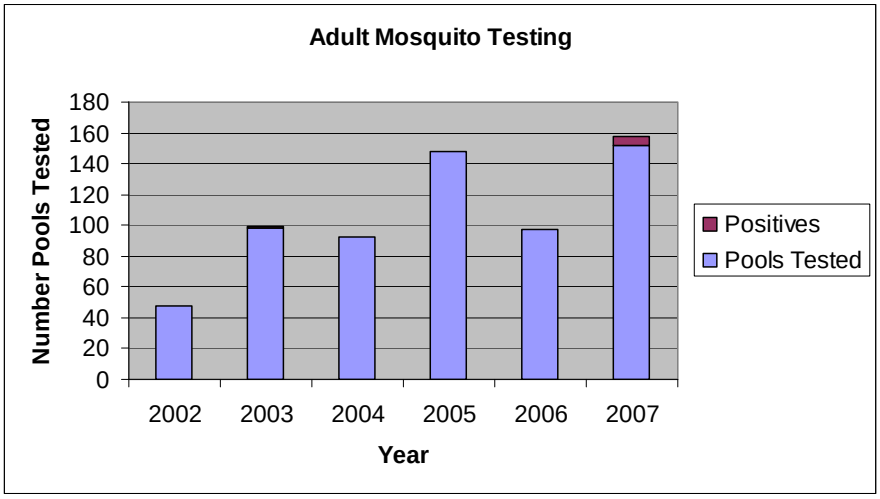
Sentinel chickens are used as an early warning detector for the presence of mosquito-borne diseases. A flock consists of 10 chickens. These chickens are tested every other week throughout the season which usually runs from April through November. Sentinel chicken flocks are located at Buena Vista Lagoon, Santee, Penasquitos Lagoon and the Tijuana River area. The flock at Penasquitos Lagoon is now in its second season and the flock in Santee has moved from Kumeyaay Lake to an area near Padre Dam. In 2003 two chickens tested positive for Western Equine Encephalitis in the flock near Buena Vista Lagoon. In 2006, no San Diego County sentinel chickens tested positive for West Nile Virus, Western Equine Encephalitis, or St. Louis Encephalitis. In 2007 one chicken tested positive for WNV in the flock at Penasquitos Lagoon.

COUNTING MOSQUITO POOLS

In 2007, as part of the elevated level of response to WNV, 152 pools (25 to 50 mosquitoes constitute a "pool") of mosquitoes were tested, and six pools tested positive for WNV. Prior to the impact of WNV on humans, VCP had been testing approximately 100 mosquito pools or more per season, depending on the mosquito population.

Figure 4 illustrates the numbers of adult mosquito pools tested since 2001. Population levels of mosquitoes in 2006 were lower than other years. This population dip reduced the numbers of collected mosquito pools. 2007 numbers were a bit higher mainly due to the increase in the use of gravid traps and additional testing done to support the human WNV case investigations.

FIGURE 4 – 2007 TRAPPING AND TESTING OF ADULT MOSQUITOES

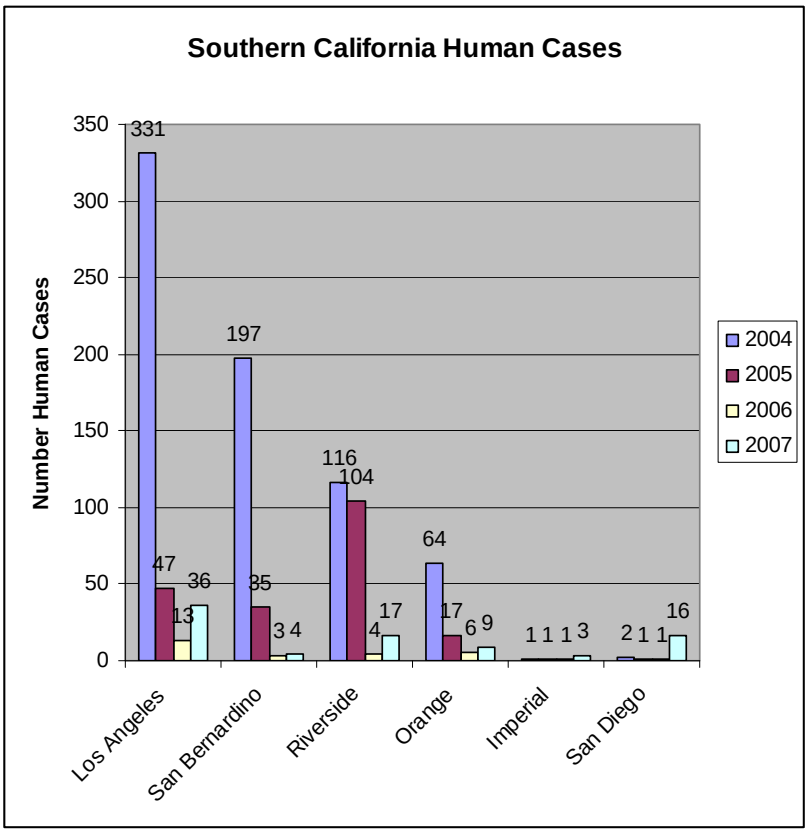


Surveillance devices called "gravid traps" were first used in 2004. These traps are for the collection of female mosquitoes searching for a place to lay their eggs. None of these mosquito pools captured in the traps tested positive for any mosquito borne disease. In 2007 the use of gravid traps was increased to several times per week during the heart of the mosquito season. A few of these collections did test positive for WNV.

In 2004 statewide there were 829 human illnesses and 27 fatalities, with the majority of cases in Southern California. In 2005 the impact of the virus shifted to northern and central California. For 2006 the cases were evenly distributed between northern and southern California but case numbers were down substantially overall. Locally, in 2007 the number of human infections took a sharp increase to fifteen cases locally acquired.

Figure 5 shows the number of positive virus results according to CDC for southern California counties from 2004 to 2007. As can be seen below, the number of cases has increased slightly in most areas of southern California when compared to 2006 but still well below the numbers of 2004.

FIGURE 5 – 2004, 2005, 2006 AND 2007 SOUTHERN CALIFORNIA HUMAN CASES



In September of 2007, the VCP increased its level of response from a "Normal Season" to a Level II Emergency Plan consistent with the West Nile Virus Strategic Response Plan. Using the San Diego County Sheriff's helicopter, VCP conducted surveillance over these areas to locate green swimming pools and previously unidentified ponds and areas of standing water. Green pools are typically neglected swimming pools where water is not filtering or moving. The aerial surveillance allowed staff to follow-up on the ground by inspecting these potential breeding sources. VCP staff discovered many new mosquito breeding sources in this manner. When there was a human illness, VCP staff went door to door on the weekends to advise neighborhood residents of the presence of the disease and investigate possible back yard sources of mosquitoes that were breeding in standing water such as buckets, tires, ponds and children's toys.

MOSQUITO CONTROL

When a mosquito source produces mosquitoes above VCP treatment thresholds, the Vector Control staff will generally work with the landowner or responsible agency to reduce the habitat value of the site for mosquitoes ("physical control"). To control mosquitoes, the

VCP conducts inspections and identifies mosquito breeding sources. The sources include privately and publicly held lands with rivers, streams, marshlands, lagoons, ponds, and various other man-made and natural sources of standing water. Land ownership of mosquito breeding sources has been identified using Geographic Information Systems (GIS). This has enabled VCP staff to educate the property owner as to their responsibility in managing standing water. Known mosquito breeding sources are evaluated during the winter months to confirm location and design treatment plans for these sources. This off season effort creates routes for seasonal workers, who then treat locations during the mosquito breeding season.

In order to achieve the county's goal of reducing or eliminating mosquito breeding locations countywide by attaining compliance with existing regulatory requirements, VCP will seek voluntary compliance in all cases. In the event that voluntary compliance cannot be attained, the VCP will work with property owners, public agencies and municipalities to ensure appropriate abatement and remediation to protect public health. Formal enforcement action is pursued if voluntary compliance is not achieved.

PHYSICAL CONTROL

The VCP directs the property owner to manage mosquito habitat areas ("breeding sites") to reduce mosquito production. This may include removal or modification of habitat conducive to larvae growth, directing property owners for the removal of vegetation or sediment, interrupting water flow, rotating stored water, pumping and/or filling sources, improving drainage and water circulation systems, breaching or repairing levees, and installing, improving, or removing culverts, tide gates, and other water control structures in wetlands. VCP staff direct the property owner to coordinate water management efforts under the guidance of federal and state regulatory agencies.

MOSQUITO BIOLOGICAL CONTROLS

MOSQUITO EASTING FISH

The mosquito fish, Gambusia affinis, is the VCP's primary biological control agent used against mosquitoes. Mosquito fish are not native to California, but have been widely established in the state since the early 1920's, and now inhabit most natural and constructed water bodies. The VCP maintains a population of mosquito fish in large tanks and purchases them from a breeder when necessary. VCP also periodically uses nets to collect mosquito fish from natural water bodies located in the County. During the mosquito breeding season, April through October, mosquito fish are made available to the public to control mosquito production only in artificial containers such as ornamental fishponds,

water plant barrels, horse troughs, and un-maintained swimming pools. The fish are available free to the public at several distribution sites throughout the county.

BACTERIAL CONTROLS

Since many mosquito-breeding sources cannot be adequately controlled with physical control measures or mosquito fish, the VCP also uses natural biological materials and/or insecticides approved by the Federal Environmental Protection Agency, California Environmental Protection Agency and other environmental agencies to control mosquito populations. When field inspections determine the presence of mosquito populations which meet VCP criteria for control (including presence of disease, abundance, density, species composition, proximity to human settlements, water temperature, presence of predators, and others), VCP staff will apply these materials to the site in strict accordance with the label instructions. The primary types of materials used against mosquitoes are selective larvicides.

1. Depending on time of year, water temperature, organic content, mosquito species present, larval density, and other variables, larvicide applications may be repeated at recurrence intervals ranging from weekly to annually. Larvicides routinely used by the VCP include Bti (Bacillus thuringiensis israelensis) and Bs (Bacillus sphaericus), as well as Golden Bear Oil 1111 and Methoprene (Altosid).1. Bti (Bacillus thuringiensis israelensis) is a bacterium that is ingested by larval mosquitoes and disrupts their gut lining, leading to death before pupation. Bti is applied by the VCP as a liquid or bonded to inert substrate (sand or corncob granules) to assist penetration of vegetation. Persistence is low in the environment, and efficacy depends on careful timing of application relative to the larval instar. Therefore, use of Bti requires frequent inspections of larval sources during periods of larval production, and may require frequent applications of material. Application can be by hand, ATV, helicopter, truck mounted equipment, watercraft, or backpack blowers.
2. Bacillus sphaericus is a biological larvicide that the VCP uses. The mode of action is similar to that of Bti, but B. sphaericus may be used more than Bti in some sites because of its higher effectiveness in water with higher organic content and increased persistence.
3. Golden Bear Oil is a short life-cycle oil combined with surfactants. Golden Bear is the only material available that is effective against pupae.
4. Methoprene, or Altosid, is a synthetic juvenile hormone designed to disrupt the transformation of a juvenile mosquito into an adult. It is applied either in response to observed high populations of mosquito larvae at a site, or as a

sustained-release product that can persist from 21 to 150 days, depending on formulation. Application can be by hand, ATV, or helicopter.

AERIAL MOSQUITO LARVICIDE APPLICATION

Beginning in 2004, the VCP began an aerial mosquito larvicide application program. Aerial application of mosquito larvicide is the best method of application in inaccessible areas. There are three criteria that need to be met before a site could be considered a candidate for aerial application:

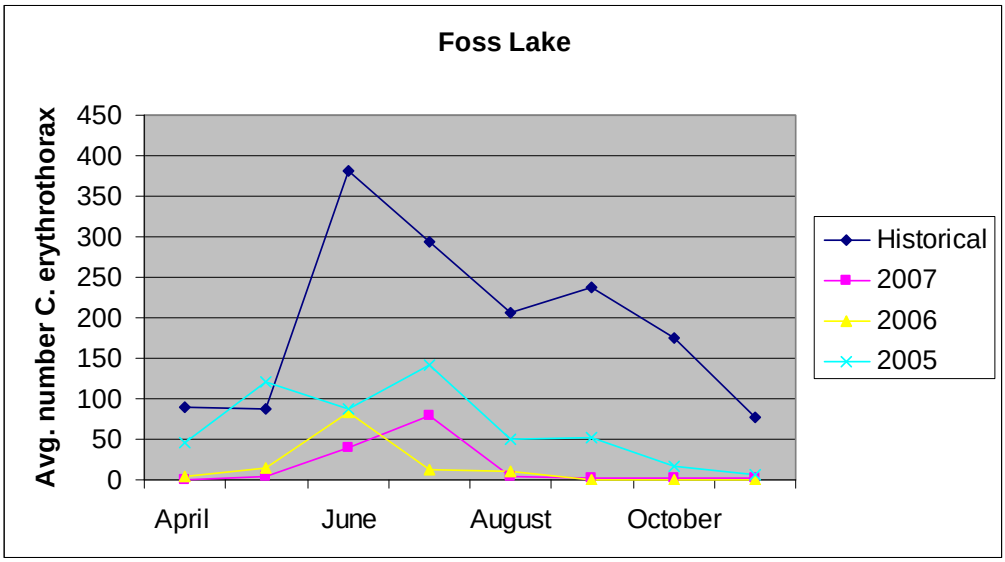
- Breeding site must be a proven mosquito breeding location
- Breeding site must be inaccessible to treat with conventional means
- Breeding site must be adjacent to an "at risk" human population with significant population

There are a number of wet, marshy areas and ponds that have thick stands of cattails and other vegetation within the County. These are prime locations for aerial applications. The VCP contracts with a helicopter application service to apply bacterial larvicides to the vegetation in the water bodies where the mosquito larvae grow. Larvicides are made from bacteria that, when applied in accordance with the manufacturer's label are very specific to mosquito larvae and will not harm other wildlife. This results in the efficient elimination of larvae before they can develop into biting adults.

Larvicides were applied monthly to mosquito breeding locations from April through November in 2007. These control efforts reduced the risk of West Nile Virus in San Diego County as well as nuisance biting mosquitoes. An ongoing cooperative effort with Camp Pendleton Marine base has further reduced the West Nile Virus' impact to the County of San Diego.

Figure 6 illustrates the effectiveness of the aerial applications for the past three years at Foss Lake compared to historical levels. This represents the overall control received at most aerial application sites.

FIGURE 6 – ADULT MOSQUITO POPULATION AT FOSS LAKE



A few monitoring locations showed greater numbers of adult mosquitoes despite aerial applications. This is attributed to increased vegetation growth at these sites that provides greater protection from natural predators and the applied larvicide. The Vector Control Habitat Remediation Program directed at mosquito breeding sources is currently being developed. The goal of the program is to promote the proper management of overgrown vegetation and accumulated sediment so that water flow can be restored to reduce mosquito breeding.

The Vector Control Program is continuing to receive support from federal and state wildlife officials that have deemed helicopter applications appropriate. Use of the helicopter is far less invasive to sensitive habitats than efforts by VCP staff conducting land treatment.

The Vector Control Habitat Remediation Program that will address chronic mosquito breeding sources is currently under development. Technology Associates International Corporation (TAIC) has been contracted to develop the Vector Habitat Remediation Program Plan which looks to develop long-term solutions to historically chronic mosquito breeding sites. The goal of the program is to implement measures that promote the proper management of water bodies and wetlands with mosquito control in mind. The remediation of water bodies by reduction of overgrown vegetation and accumulated sediment will enhance and restore water flow reducing mosquito breeding potential. This plan will take into account the protection of wildlife, water quality and those agencies concerned, with the intent of restoring the ecology into a healthy balance. The Vector Habitat Remediation Plan will be brought before the Board of Supervisors for review and approval in the fall of 2008.

MOSQUITO ADULTICIDE

In addition, if large numbers of adult mosquitoes are present and public health is threatened, the VCP may use non-selective, low persistence aerosol adulticides to mosquito habitats at a distance from residential areas. Adult mosquito control is a component of the WNV Strategic Response Plan. The use of adulticides has not occurred in the past eleven years. Mosquito adulticides are considered a last resort to control adult mosquito populations should the presence of disease reaches epidemic levels. Adulticide application(s) must be approved by both the Director of Environmental Health and the Public Health Officer. A contract for aerial spraying of adulticides, if deemed necessary to protect public health, is in place.

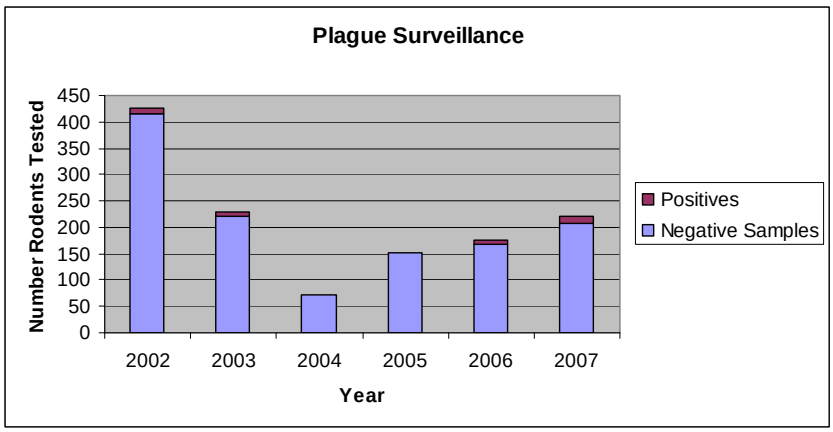
RODENT BORNE DISEASE SURVEILLANCE

PLAGUE

No human cases of plague were reported in San Diego County during 2007. Plague-infected fleas bite and infect rodents, usually ground squirrels. These rodents can act as reservoirs for the disease. Humans and their pets can be infected if bitten by infected fleas when visiting campgrounds or other rural areas. Ground squirrels are routinely tested at campgrounds by collecting blood samples for plague testing.

Of the 220 ground squirrels sampled for plague in 2007, twelve tested positive. All of these ground squirrels were from high elevation campgrounds in our local mountains. This was a significant increase in plague surveillance, as compared to 2006, but still a bit less than 2003 when 228 ground squirrels were sampled. Plague surveillance has been conducted mostly at higher elevations and has often yielded one or more Plague-seropositive ground squirrels each year. In 2006 plague surveillance was expanded to lower elevations of the county and this continued in 2007. This testing verified past indicators that Plague currently occurs only at higher elevations such as our local mountains. Figure 7 describes Plague surveillance over the past six years.

FIGURE 7 – PLAGUE SURVEILLANCE



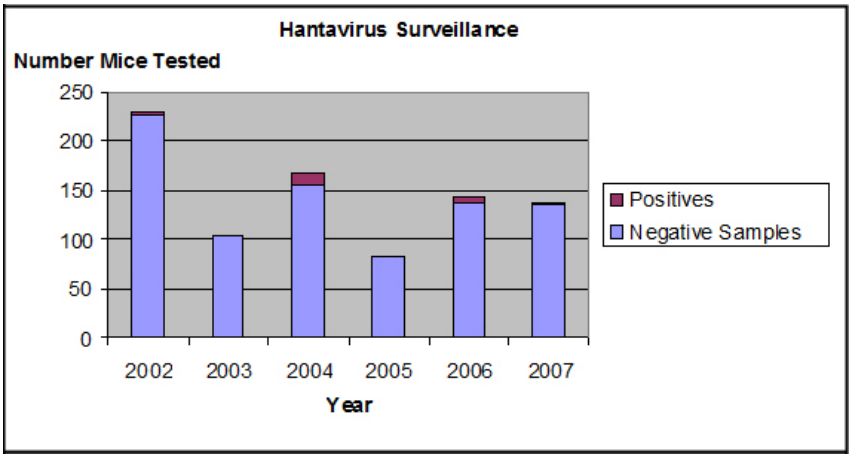
HANTAVIRUS

Both the hemorrhagic and respiratory strains of Hantavirus occur in wild mice in San Diego County. Humans typically become infected with Hantavirus by breathing air-borne particles of wild mouse droppings contaminated with the virus. Most human cases occur when people open up and occupy mountain cabins or other small-enclosed structures, which are infested with wild mice.

In 2004, the first locally acquired human case of Hantavirus was reported in the East County community of Campo. During 2005, 84 wild mice were sampled and none tested positive for Hantavirus. Sampling increased in 2006 to 143 wild mice with six testing positive. While more attempts were made to capture mice in 2007, those attempts resulted in about the same number of mice captured and tested.

Figure 8 describes Hantavirus surveillance for the past six years. VCP has created a site on its webpage: www.SDVector.com and a brochure to inform residents how to properly clean up mouse droppings to help prevent them from acquiring Hantavirus. When wild mice test positive for Hantavirus, the site is re-sampled to determine the prevalence of the virus in the wild mouse population and the area is posted with animal caution signs. Public education through press releases, media interviews and outreach in the area the disease is detected is conducted.

FIGURE 8 – HANTAVIRUS SURVEILLANCE



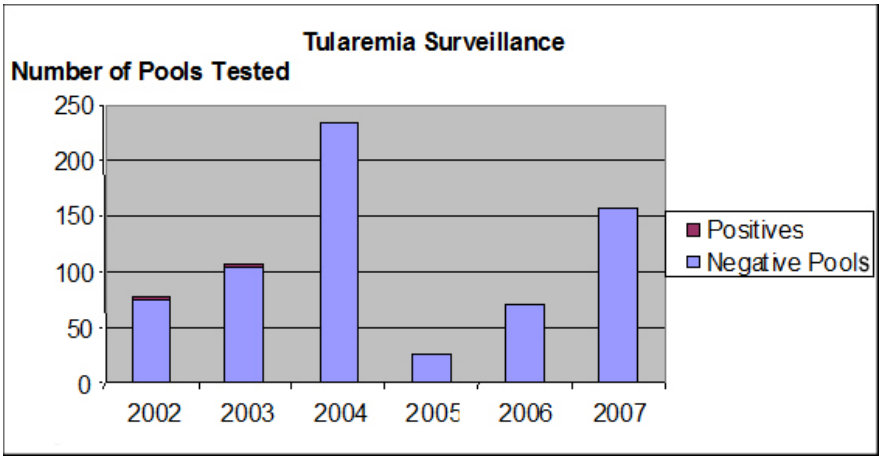
TICK BORNE DISEASES

TULAREMIA

Tularemia is typically found in some of the smaller mammals and, in particular, rabbits. The two common species of Dermacentor ticks found in the county can pick up the disease when they feed on rabbits and pass it to the next animal on which they feed. Tick bites are not the only way tularemia can be transmitted. Other biting insects can transmit the bacteria and the disease can be transmitted by direct contact with an infected animal. This is why it is very important not to handle any wild animals, especially if they appear to be ill.

Figure 9 describes the surveillance conducted for Tularemia over the past six years. In 2006, 71 pools (10 ticks per pool) of ticks in the Dermacentor group were submitted for testing. There were no positive results. Tick populations increased in 2007 allowing VCP to submit 157 pools for Tularemia testing. None of these pools tested positive for Tularemia.

FIGURE 9 – TULAREMIA SURVEILLANCE

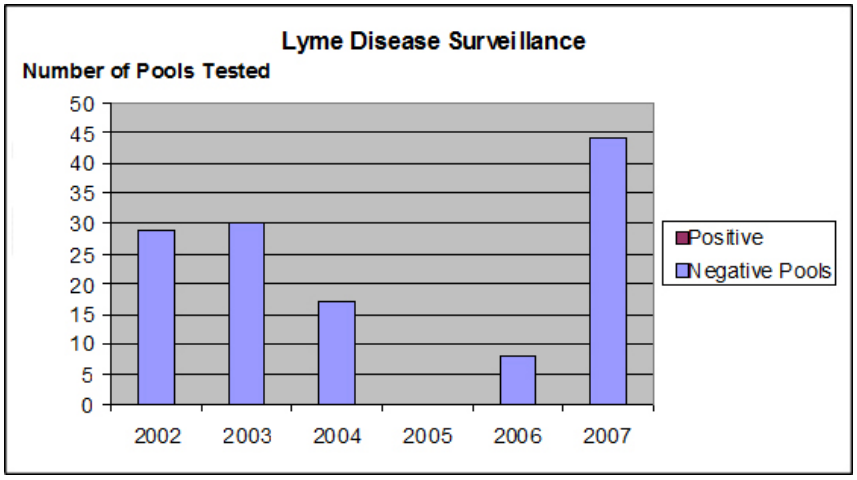


LYME DISEASE

Testing ticks in 1994 and 1995 demonstrated that Lyme disease does occur in San Diego County, but there have been no positive ticks since 1995. The primary vector for this disease, Ixodes pacificus or Western Black-Legged Tick, is commonly found in most rural areas of the county. During 2005, VCP was unable to collect enough ticks to perform any Lyme testing. The heavy rains during tick season may have lowered the population or spread them out so thin that it made collecting very difficult. The populations in 2006 remained low; however, enough ticks were collected to submit 8 pools for testing. Populations in 2007 did increase, allowing VCP to submit 44 pools for Lyme disease testing. All of these pools tested negative.

One human Lyme disease case was diagnosed in San Diego County in 2006. It is thought that the case may have been locally acquired, due to lack of travel on the part of the victim. Areas where the victim had been were checked for ticks and warning signs were posted as a precaution. In 2007 there were no confirmed locally acquired human cases. Table 8 illustrates the surveillance conducted for Lyme disease over the past six years.

FIGURE 10 – LYME DISEASE SURVEILLANCE



CONTROL OF OTHER VECTORS

RODENTS

Rodents present in the County of San Diego include the Norway rat (Rattus norvegicus), and the Roof Rat or Black Rat (Rattus rattus). These are subjects of VCP action. Native rats and mice such as the Dusky-Footed Wood Rat (Neotoma fuscipes) and the Deer Mouse (Peromyscus maniculatus) generally do not coexist with humans and are not the focus of control efforts, but control advice is offered. In addition to being unsanitary, rodents harbor and transmit a variety of organisms that infect humans. Rodent urine may contain the bacterium that causes Leptospirosis, and their feces may contain Salmonella bacteria. Infected rat fleas may transmit Bubonic Plague and Murine Typhus. Rat bites may cause bacterial rat-bite fever or infection. P. maniculatus can transmit Hantavirus through bodily excretions. Gnawing by rats causes damage to woodwork and electrical wiring, resulting in shorted circuits and potentially, fires. Additionally, an abundance of rats can cause economic losses, loss of use of public recreational areas, and loss of the enjoyment of property. Dusky-Footed Wood Rats carry bacterial infections that may be passed on to humans, horses, and domestic pets by the bite of tick vectors.

VCP assists residents with their rat control efforts by providing inspections and consultations. These include efforts to exclude rats from residents' homes and businesses. In 2007 staff expanded community awareness by making contact with adjacent neighbors when evidence of rats was found. The VCP staff performs exterior site inspections to educate residents regarding the best methods to exclude rats from entering the home. During these site visits a rat control starter kit is provided to the home owner. These kits include a bait station, traps, a video and instruction materials for control measures. The

web site: www.SDVector.com has information available on domestic rat control as well as an ability to file a Request for Service on-line.

Staff have made several presentations to homeowner and community groups on rat control and have distributed educational materials at community events. VCP staff coordinate work with other regional agencies to prevent and eliminate rat infestations and harborages. In 2007, the VCP staff responded to 1877 complaints from residents pertaining to domestic rats. The VCP primarily relies on public education and public cooperation for domestic rat control and employs no regulatory authority.

Rodenticides, traps, and other rodent control techniques were used for emergency response in 2007. A rat abatement program was initiated in the fire impacted areas of the county and in the Mt. Soledad Landslide within the City of San Diego. Well over eight hundred rat control starter kits were distributed to homeowners who requested an exterior site inspection during 2007.

FLIES

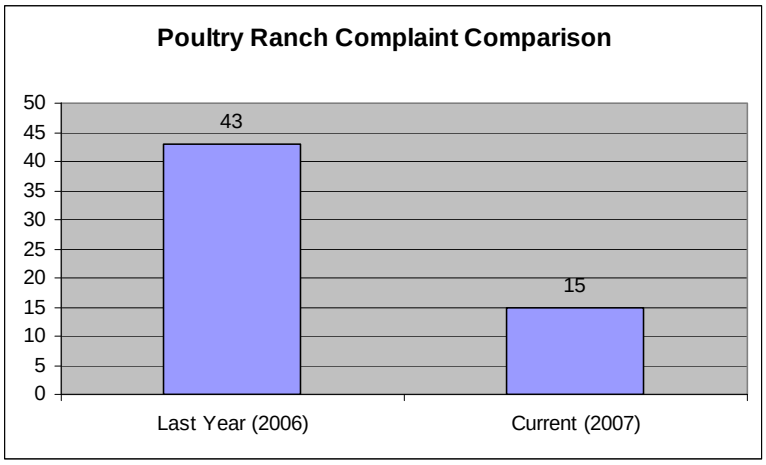
VCP staff respond to general fly complaints with on-site visits and public education about sanitation, fly exclusion, and mechanical as well as chemical control. Flies are a threat to public health, a nuisance, and are common in the unincorporated areas of the County of San Diego. Back yard fly sources can be poultry, horse and livestock manure. Flies can also be found within the city limits breeding in garbage cans, dumpsters, compost piles, and in organic matter. Besides contaminating food with eggs and maggots, flies can carry bacteria that cause intestinal diseases. They are capable of carrying more than 100 pathogens, such as typhoid, cholera, salmonella, bacillary dysentery, tuberculosis, anthrax, ophthalmia and parasitic worms.

The most common fly is the House fly (Musca domestica) and is primarily a summer fly. It has a tremendous breeding potential and during the warmer months can produce a generation in less than one week. The house fly populations can build up to huge numbers depending on the amount of the food sources, and can be particularly troublesome around poorly managed poultry ranches or other livestock operations where manure accumulates and is not able to dry. They are strong fliers and are known to fly as far as 20 miles away.

The Little house fly (Fannia canicularis) is known as the spring fly or cooler season fly. The little house fly ranks second, and in some areas, may equal the house fly as the predominant pest species, particularly in and around poultry ranches.

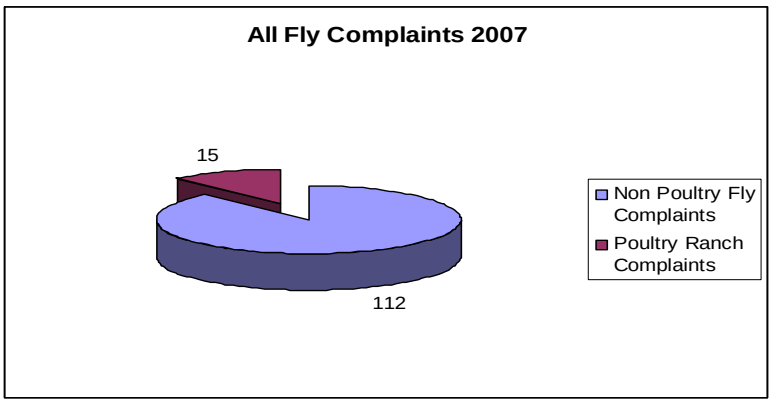
VCP's Fly Abatement Program operates under the authority vested to it by San Diego County Ordinance No. 7025, Regulatory Ordinances Relating to the Prevention and Control of Fly Breeding on Commercial Poultry Ranches and Other Sources. Annual Manure Management Proposals are prepared by each rancher for approval by VCP. Routine as well as complaint-based inspections and enforcement are used in order to assure the prevention and abatement of conditions productive of flies which may constitute a threat to public health and welfare.

FIGURE 11 – COMPARISON OF FLY COMPLAINTS FROM POULTRY FARMS



In 2007, San Diego County residents lodged 127 complaints concerning nuisance flies, of which only 15 involved commercial poultry ranches. This is a decrease of 65% from 2006. There were twenty-eight poultry ranches containing approximately 4 million birds operating in San Diego County in 2007.

FIGURE 12 – ALL FLY COMPLAINTS 2007

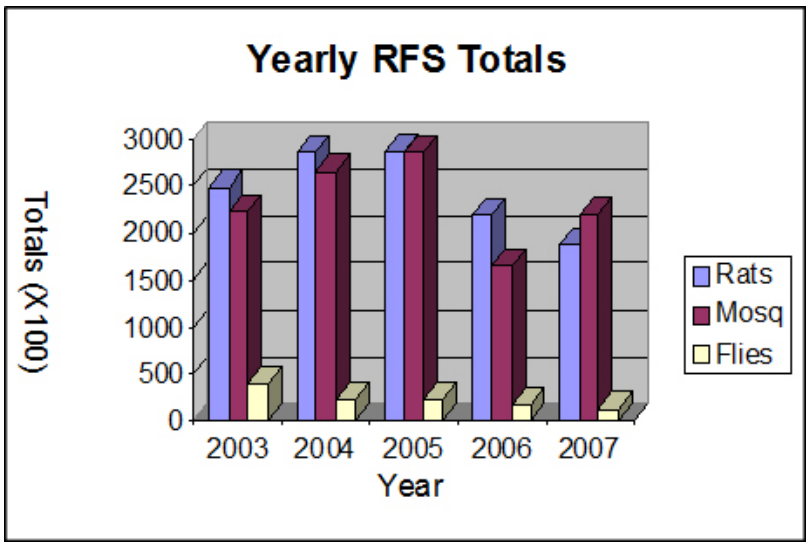


During the 2007 Firestorm a commercial chicken ranch in Ramona lost 20,000 chickens, four (4) poultry houses, sixty (60) yards of manure and thirty-six (36) yards of feed. The chickens were partially consumed by the fire; however, they were rapidly becoming a public health threat as they were decomposing on site. In order to mitigate this threat, VCP staff coordinated a cooperative effort with the poultry and solid waste industries, the property owner, contractors, and the Solid Waste Local Enforcement Agency. The chickens, feed and manure were removed from the site and disposed of in a sanitary manner at the Ramona Landfill. This massive effort was completed in 10 days and prevented a massive fly outbreak that would have represented a public health threat during the initial post fire recovery.

RESPONSE/CUSTOMER SERVICE

In 2007 VCP staff responded to 2149 citizen complaints or service requests regarding mosquito nuisance and breeding (Figure 13). While many complaints involved major mosquito breeding sources, most involved smaller or intermittent backyard sources. VCP staff responded to 1827 citizen complaints or service requests relating to domestic rats. VCP staff responded to 127 citizen complaints of excessive numbers of flies.

FIGURE 13 – VECTOR CONTROL SERVICE REQUEST COMPARISON

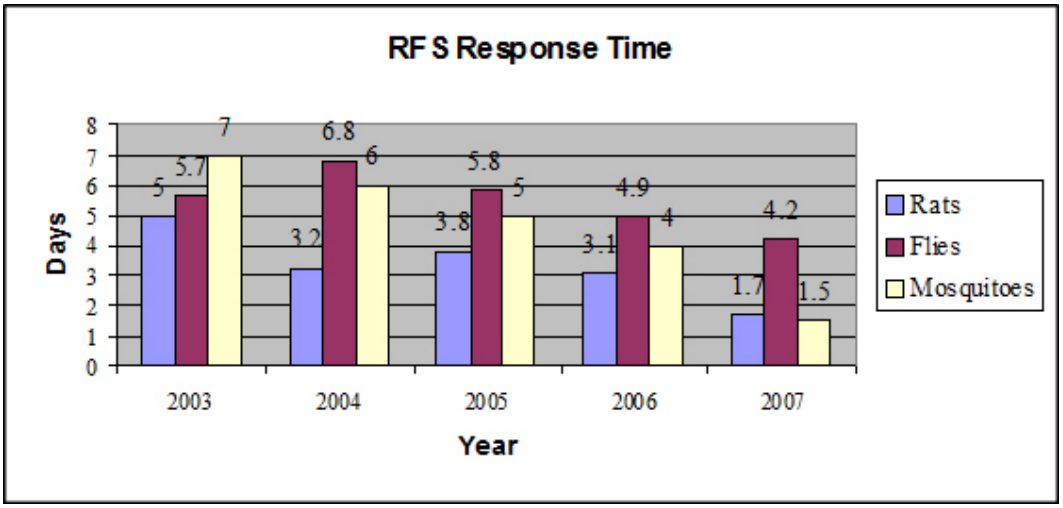


Each month VCP sends a customer service survey to 20% of the complainants from the prior month. Of those survey forms returned to VCP, 91% of the respondents rated the service they received as Satisfactory or better and 81% of the respondents rated the service as Excellent.

During 2007 the average response time, excluding weekends and holidays, for complaints is shown below on Figure 14:

- 1.5 days for mosquito complaint investigation
- 1.7 days for rat complaint investigation
- 4.2 days for fly complaint investigation

FIGURE 14 – OVERALL AVERAGES COMPLAINT RESPONSE TIMES



NEW PLANNED EFFORTS

VECTOR CONTROL HABITAT REMEDIATION PROGRAM

The Vector Control Habitat Remediation Program that will address chronic mosquito breeding sources is currently under development. Technology Associates International Corporation (TAIC) has been contracted to develop the Vector Habitat Remediation Program Plan which looks to develop long-term solutions to historically chronic mosquito breeding sites. The goal of the program is to implement measures that promote the proper management of water bodies and wetlands with mosquito control in mind. The remediation of water bodies by reduction of overgrown vegetation and accumulated sediment will enhance and restore water flow, reducing mosquito breeding potential. This plan will take into account the protection of wildlife, water quality and those agencies concerned, with the intent of restoring the ecology into a healthy balance. The Vector Habitat Remediation Plan will be brought before the Board of Supervisors for review and approval in the fall of 2008.

PLAGUE SURVEILLANCE AT PORTS OF ENTRY

Because of the increased level of foreign related goods now entering our Ports-of-Entry, increased vector control surveillance is needed. Therefore, VCP will be instituting a trapping program for rats in Ports-of-Entry areas to test for the presence of Plague. This testing will occur where freight is received by boat, plane or truck from foreign points of origin. Surveillance will occur twice a year with the collected blood samples tested for Plague. The fleas collected from the rats will be identified by species to determine if they are competent vectors for Plague. Currently in San Diego County, Plague has only been found in ground squirrel populations within the higher elevations of the county.

MANAGEMENT CHALLENGES

The Vector Control Program is faced with a wide range of management challenges that includes: public resistance to insecticide use; increased population vulnerability to vector-borne disease due to expanding urbanization and immigration; increased risk of emerging vector–borne diseases due to global environmental change; increasing vector habitats due to development induced changes in hydrology and land-use; and reduction of available traditional vector control methods due to an increase in regulatory restrictions.

To meet the wide range of vector control management challenges stated above a consultant has been hired to review the staffing needs of the program and make recommendations for future changes.